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Treasure from Oil

By Cedric Jagger

Oil is today the starting point for a whole range of everyday things, from the 'Alkathene' bowl in your kitchen to 'Terylene' clothes and 'Perspex' sheeting. But before oil will yield its treasure, it must be "cracked." The mysteries of this wonder of our chemical age are here explained.

TWENTY-THREE million tons a year! That, at the end of 1956, was the staggering rate at which Britain consumed petroleum products; and still the demand leaps upward. Surprisingly, only about a quarter of this total represents fuel for the nation's transport—what of the rest?

A small part of the answer to this question is to be found at Wilton, where I.C.I. is operating two plants for the production of olefines and is deeply engaged in the construction of a third. Yet the story really must start before that, with the thick yellow-black oil that comes by tanker from the Middle East, preferably via Suez, to finish up at one of the oil companies' big refineries in the United Kingdom. Here begins the first part of the breaking-down process.

The vital importance of oil lies not only in our petrol ration, nor in the fuel it yields to drive industry—a use which may be expected to lessen when, in the years to come, atomic power takes over—but also in the immensely valuable organic chemical compounds, the raw materials of many other industries, which can be distilled from it. The oil refinery, giving the crude oil its first processing, obtains a number of these, either as liquids or gases, as well as various grades of petrol and fuel oil; and I.C.I., taking just one of these "fractions," as they are called, secures from it a further series of products, all of great industrial value, which include olefines.

But, you may ask, what exactly are olefines? They are a family of organic chemicals—"organic" meaning that, like all living matter, they contain carbon—which are closely related to one another in chemical structure. They are also veritable "live wires," for they will willingly react with other substances to form a great diversity of finished products.

So far as the Wilton plants are concerned, three members of this family—ethylene, propylene and butadiene—constitute the prime output. Ethylene may finish up in your car as ethylene glycol anti-freeze. Most of it, however, goes to make 'Alkathene'—I.C.I.'s polythene—and it is also one of the raw materials in the manufacture of 'Terylene.' Propylene yields a variety of solvents—for paints, among other things, and for 'Perspex.' Butadiene is needed for the 'Butakon' range of plastics, sometimes loosely called artificial rubbers.

So much for the versatility of the olefines; it is also important to note that they do not have to travel far, after manufacture, to prove their worth. With one principal exception, their transition into finished products takes place on their own doorstep, at Wilton itself. Propylene, the odd man out, has only to pass through one of the pipelines linking Wilton with Billingham before it, too, can justify its existence.

But let us return to the oil refinery. From it I.C.I. buys one fraction of crude petroleum—naphtha—and this is coasted round to Teesport, 3½ miles from Wilton, where it can be stored in two large floating-roof tanks. These tanks are so called because their tops float on the contents, like pontoons, rising and falling with the level of the liquid inside, thus ensuring that there is no space above the oil in which a concentration of inflammable gases could build up. From Teesport the naphtha is piped to two exactly similar tanks—all four have a capacity of nearly 8000 tons apiece—on the Wilton site. Thence it will eventually pass into the plant through a smaller balance tank.

Chemistry of Cracking

The chemistry of cracking naphtha is comparatively simple. The oily liquid is heated to 690° C.—to the layman, who thinks of its intrinsic qualities, an enormously high temperature—and mixed with steam which is at the even higher temperature of 925° C. A couple of seconds later the resultant hot gases are quenched or cooled—otherwise the reaction would go too far and all the butadiene and most of the propylene would be lost. This part of the process takes place in a veritable nightmare of pipes, in one of which the actual cracking is done.

The outcome from this process is a mixture of eleven gases, which have got to be separated and—particularly so far as the three main end products are concerned—collected in a pretty pure form. This is where the gas separation plant comes in. In principle this plant consists of compressors for raising the pressure of the gas mixture and refrigeration systems for cooling it. By this means some of the heavier gases condense into liquids—just as steam condenses on a cold window—while the lighter gases remain as such.

Fractionating Columns

However, with eleven gases to deal with it is obvious that only a partial separation can be achieved in a single stage, so fractionating columns—massive steel vessels standing on end, which are simply big and more complicated brothers of the classic bootlegger's still—are necessary. A series of these are employed, each operating at a different combination of temperature and pressure; the stream of gases, entering each one somewhere near the middle, resolves into liquids condensing out to the bottom, and remnant gases rising to the top. The whole operation is a progressive one, and at each stage the constituents separating out at the column ends become richer, purer products.

S. HERBERT

NORTH SEA

RIVER TEES

WILTON WORKS

TEESPORT OIL-STORAGE

CRACKING SECTION

OIL HEATER

STEAM HEATER

QUENCHER

PURIFICATION

PURIFICATION

'BUTAKON' PRODUCTS (FROM BUTADIENE)

EMULSION PAINT

HYDROGEN METHANE to AMMONIA FACTORY

FRACTIONATION

ETHYLENE

ETHANE to AMMONIA FACTORY

PROPYLENE SOLVENTS

TERYLENE Polyester ICI Fibre

'TERYLENE' POLYESTER FIBRE

POLYTHENE

MOTOR SPIRIT

GLYCOL ANTI-FREEZE

'PERSPEX'

Wilton's No. 1 cracker, *showing on the right the Olefines Works office block, and beyond the open network of pipes which is the cracking plant*

After fractionation the initial mixture of eleven gases has been broken into five separate streams.

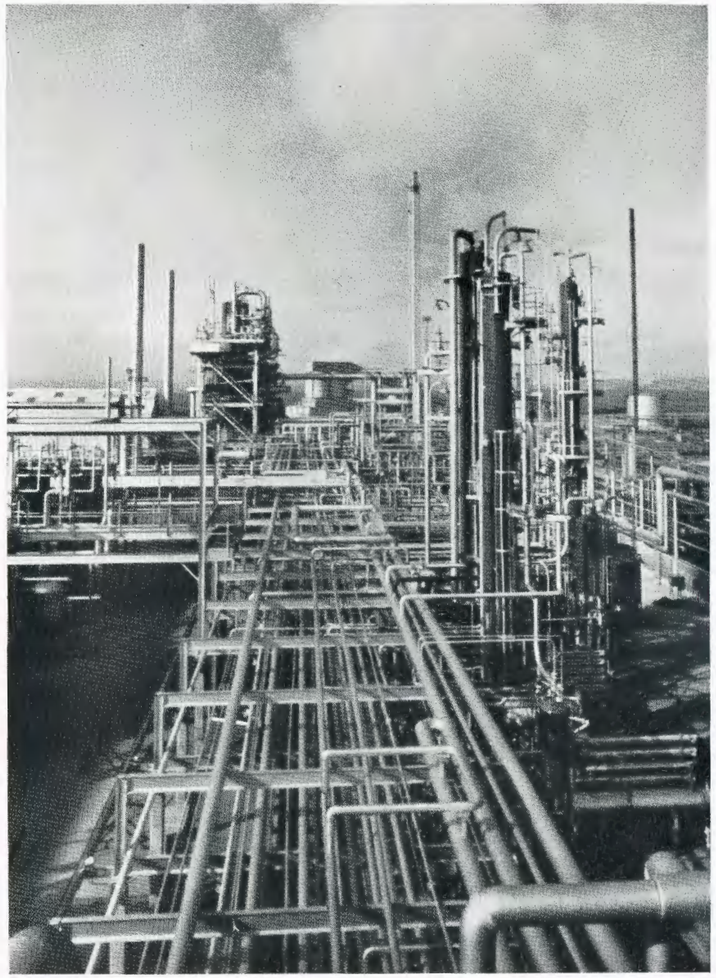
Even if the chemistry is simple, a very great deal of engineering indeed went into the construction of the olefines plants. Think of temperatures ranging from 925° C. (that of the superheated steam used in the "cracker") down to the lowest point of —140° C. at one stage of separation; think also of gases at very high temperatures moving through transfer pipes at over 100 miles per hour. Interpret all this in terms of 55 miles of assorted pipes and a mass of expensive equipment, such as furnaces and boilers, compressors and pumps of various types, coolers, heat exchangers, the separating columns—and no fewer than 17,000 valves on No. 1 plant alone—and one starts to see the project in true perspective.

I.C.I.'s policy has always been to use existing installations as object lessons for the future. The experience gained in operating plant No. 1 has enabled I.C.I.'s engineers, while not materially altering the basic process, to incorporate many modifications into plant No. 2. An example of this is the use, at certain stages, of a higher range of pressures, which has enabled the equipment affected to be of smaller size. This has resulted in a material saving in the use of expensive stainless steels, which are a big item in the capital costs of a new installation. Without doubt a similar approach on the basis of experience is even now being made to the conception of plant No. 3.

Now to delve into past history for a moment. The olefines are by no means newcomers to I.C.I. Ethylene, for example, made from ethyl alcohol, was already on the Company's range in the early 1930s, and it was production from this source which supported 'Alkathene' in 1939. So when in 1946 I.C.I. decided—for the first time anywhere on a large scale—to utilise the steam cracking of naphtha to produce olefines, there was already plenty of customer plant waiting for the output.

The first plant came into operation in 1951 and the second at the end of last year; when the third plant gets going early in 1959 I.C.I. will have the capacity to make rather more than 100,000 tons a year of ethylene alone. The group of I.C.I. plants producing products from the olefines comprise the largest group of petroleum chemical plants in Europe; it is also the largest venture undertaken by I.C.I. since its formation.

The reliability of these several million pound olefine plants is of paramount importance, for if they break down many more millions of pounds' worth of plant fall idle. Hence a very rigid control broods over them. The first thing that happens to everyone entering the premises is a polite request to hand over matches or lighter, and "no smoking" is the rule thenceforth. Fire precautions are everywhere impressive, especially so the press-button arrangements for blanketing storage tanks with foam in case of need.



Wilton's No. 2 cracker, *a more compact job as the result of solving some tricky engineering problems in the light of working experience*

Process control is even more remarkable. From two principal control rooms, one for the "cracker" and one for the separation plant, an enormous yet orderly mass of automatic instruments, watched over by a mere handful of men, is constantly checking and adjusting every stage of the process.

What does all this add up to? The answer is that No. 1 plant, in its five years of existence, has given an outstanding performance of 363 days in one calendar year, followed by a continuous run of 720 days, which takes some beating.

Everyone who visits the olefines plants carries away one particular memory—and it is always the same one —of that tall and slender chimney, with its pilot light flaming at the top, which towers 200 ft. and more up into the sky. It is the flare stack, the safety valve of the plant, where dangerous gases piling up anywhere in the process—due perhaps to a breakdown—can be safely channelled off and burnt up, out of harm's way. Normally, there is nothing to be seen at the top of the flare stack except the pilot light—but that light never goes out. While it burns, the story of naphtha and the olefines continuously and peacefully unravels itself beneath. The ancient Egyptians too had a perpetual light, which burnt in their temples and was never allowed to go out. It seems a peculiar quirk of fate that the fuel they burnt was—you can guess—naphtha!

One man and his job—51

Inspecting Engineer

JACK RILEY rolled down his shirt-sleeves, pocketed his notebook and lit a pipe. It was 9.30 p.m. in a Stockholm suburb, and he had just finished a test run of a nitrogen compressor built by A.B. Atlas Copco for Wilton Works.

"What's the hurry?" I had asked him as he stepped off the airline bus in Stockholm that evening. He had paused only to check in at his hotel before hailing a taxi to take him to the Atlas works, ignoring the sights and sounds of the beautiful city.

"Wilton have got their tongues hanging out for that compressor," said Riley. "There's a four-hour test run to be done tonight. Tomorrow I've got to see the machine stripped right down and examine every part. If I pass the compressor there's nothing to prevent it from being shipped at once."

This was Riley's twelfth trip to Sweden in two years. As I.C.I.'s Senior Inspecting Engineer for the Middlesbrough area he is primarily responsible, with a team of six, for inspecting every item of plant and equipment ordered by the Company in an area which stretches from Berwick in the north to Northallerton in the south and from the east coast as far west as the Pennines. As a matter of convenience he also deals with orders made in Sweden.

"Mostly compressors," he explained. "We've had thirteen from Atlas. And they're building us a rolling mill for the new titanium plant in South Wales—I've been inspecting that piecemeal for some time now."

There is a saying in I.C.I. that the Company's inspection service is as good as Lloyd's. That this is no mere fulsome compliment is proved by the fact that many of I.C.I.'s foreign licencees—those licensed to manufacture polythene in the U.S.A., France and Japan, for instance—depute I.C.I.'s inspection service to inspect plant they have ordered from U.K. suppliers.

When an I.C.I. Division orders equipment from a manufacturer, the inspection office in that area is informed. From that time on an inspecting engineer has the right, stipulated in the contract, of free access to the manufacturer's works at any reasonable time.

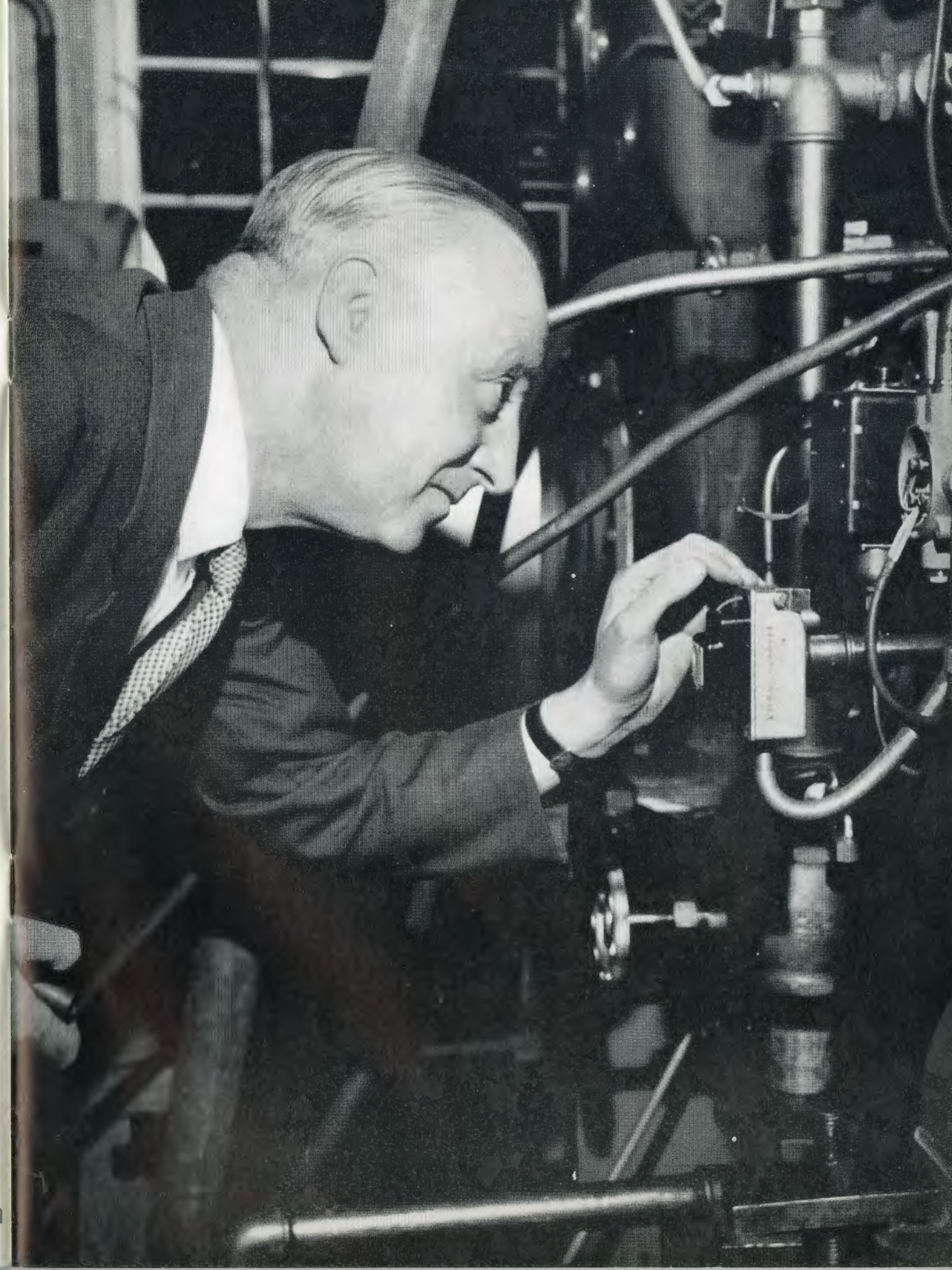
"We've got to have the specifications for the job at our finger-tips," said Riley. "Take a welded vessel, for instance. Before it was assembled I should have to see that the metal to be used was up to scratch for quality. After the plates had been welded I should go to the works and look at the manufacturer's radiographs—those are the X-ray pictures he takes of every section of the job. If there's the slightest doubt about a weld I have it chipped out and done again and new radiographs made."

Welding is probably the biggest single possible source of error in engineering work, and it receives a great deal of attention from Riley and his colleagues. A Member of the Institute of Mechanical Engineers, he has to keep pace with the latest scientific methods of inspection—ultrasonics and gamma-rays, for instance, which are now sometimes used instead of X-rays for inspecting welds. He must be familiar, too, with the different techniques of welding, such as metal arc, inert gas arc, atomic hydrogen, submerged arc, and so on.

The Inspecting Engineer must be ready to inspect anything from a diesel-electric locomotive to a high-tensile steel bolt. Working from his home and travelling around the area by car, he probably reports on forty jobs a week—and all the reports are typed out at home with two fingers after business hours. Engineering manufacturers have a habit of working week-end shifts, which means that Riley and his colleagues are as likely as not to be called out on Saturdays or Sundays to inspect a job that must not be held up.

Back in his hotel room that night, Riley took out his notebook again and started to write his report on the running test of the compressor. If the stripped-down machine showed no faults the following morning he would pass it and stamp it with his inspector's stamp: the initials J.H.R. over the I.C.I. roundel. Where it has not been obliterated by time or paint this mark can be seen on thousands of pieces of plant in I.C.I. Divisions—quite a memorial to Jack Riley's thirty years with the inspection service.

M.J.D.



Jack Riley

MODERN CRYSTAL GAZING

By J. P. Lewis (Head Office)

In recent years a new weapon has been added to the armoury of the chemist, who can today identify a chemical substance without the labour of "taking it to pieces" by analysis. The crystals of every substance have their own tell-tale "fingerprints," many of which are now recorded in the Barker Index.

THERE is a story that a gipsy woman once bought herself a crystal ball intending to become a fortune-teller, but sold it again because she could not see any future in it. It is an irony of our language that these so-called crystals which fortune-tellers use are not really crystals at all, scientifically speaking. Real crystals are regular many-sided solids with flat faces and sharp edges, like the crystals of sugar or soda or Epsom salt. Glass is often cut into crystalline shapes—for chandeliers, for example—but this is only an artificial form imposed on it, not its natural form. Precious stones, on the other hand, are real crystals, and although they are almost always artificially cut when we encounter them in jewellery, the cutting is mostly done along the natural "grain" of the crystalline structure of the material.

Now the fact that real crystalline substances do have this natural grain, which means that they can be naturally cut into some shapes but not others, is a very important fact indeed. It means that although any one substance can produce crystals of all sorts of shapes and sizes—flat and plate-like, or long and needle-like, or anything in between —*the angles between the faces of such crystals are always the same for the same substance. What is more, these interfacial angles are absolutely characteristic of the substance, just as finger-prints are characteristic of people: with a few exceptions, no two substances have crystals with the same interfacial angles.* This fact has been known since the last century, when a great many distinguished scientists devoted themselves to the study of crystals and even created a special science, known as crystallography. Moreover, since a very large proportion of all the chemical substances that occur in the world do form crystals naturally, this particular property of crystals was soon seen to be of immense potential importance to chemists, for it opens up the possibility of discovering the chemical composition of any crystalline material without going through all the labour of chemical analysis, *and without destroying the specimen with chemical tests* (an extremely important consideration if only a small quantity of the substance is available).

It was a great Russian crystallographer, Fedorov, who first launched a project for compiling an index of substances catalogued by their crystal angles, rather like the finger-print index at Scotland Yard. He did not himself succeed in solving the essential preliminary problem, however, of enabling people to decide easily which of all the very large number of interfacial angles on a crystal should be chosen for identifying it, and of course without guidance on this point there is no guarantee that any two people will look at a crystal in the same way. It was an English pupil of Fedorov, Dr. T. V. Barker of Oxford, who solved this problem in the 1920s, but unfortunately he died in 1928 when the work of actually compiling a "rogues' gallery" of crystals was hardly begun.

The work of translating Barker's proposals into this practical form where it can be of real use to chemical analysts was taken up by a host of research workers all over the world under the general leadership of two of Barker's pupils at Oxford, Dr. Mary Porter and Mr. R. C. Spiller. It was of necessity an immensely long task, and it went on, under great difficulties, all through the last war.

At the end of the war the work had reached a stage where publication of the Barker Index of Crystals, as it had come to be called, could begin, and a special committee was set up to supervise this publication, with representatives of the Government, various learned societies, and some industrial firms, including I.C.I. The first volume of this huge reference work, cataloguing some 3000 crystalline substances, appeared in 1951, and this has been hailed by reviewers as an event of considerable importance. The second volume appeared this year, and the third and last will come out soon after. It is one of the less happy aspects of this story that Mr. Spiller died soon after the first volume appeared, having struggled on in his editorial labours against the handicap of increasing ill health for several years before.

. . . such a tiny crystal

Of course, even when the publication of this first edition of the Index is complete it will only catalogue a limited proportion of all the crystalline substances in existence, for new substances are discovered daily—dozens a month in the Dyestuffs Division of I.C.I. alone. However, it is a beginning, and since the Index does cover a great many of the commonest chemical substances its utility is considerable even as it is. Moreover, now that this method of identifying substances is available to the scientific world it is likely that more and more research workers will take to "finger-printing" new substances in this way by measuring and publishing their "Barker angles," so that the Index will grow. Even before that happens, any individual research worker can build up his own private index of the substances he is likely to be interested in so that he can identify them again without chemical analysis whenever he meets them.

How do you measure the angles between two faces of a crystal? Not, obviously, with a schoolboy's protractor—only a very few crystals are big enough for anything like this to be feasible, and even then it would not be accurate enough. The best instrument is a two-circle goniometer, which uses the reflections of a beam of light from each of the crystal's faces in turn, the angles being measured with a telescope on a rotating scale rather like a sextant's.

With this sort of instrument a crystal only a quarter of a millimetre long can be measured to within a fraction of a degree, and with the help of the Barker Index it is possible to identify the composition of such a tiny crystal without any chemical tests whatever in less than an hour—*and still have the crystal left intact afterwards.* A notable case of such use is the identification of the composition of tiny crystals deposited in the corner of a man's eye and impairing his sight: it was proved that they were crystals of a drug he had been taking for medical treatment.

For obvious reasons two-circle goniometers have not been very common up till now, and those which were made were fairly expensive. With the publication of the Barker Index, however, a need has arisen for these instruments to be made available as cheaply as possible. One of the most interesting features of this story, from the point of view of the *Magazine*, is that it is one of the I.C.I. representatives on the Barker Committee, Mr. L. W. Codd, who has met this need. In collaboration with an I.C.I. engineer, Mr. W. T. Moore, he has designed a beautiful two-circle goniometer which is at once cheap and accurate. He was able to improve on all existing designs precisely because, as a yachtsman, he knew something about sextants! (Incidentally, it was Mr. Codd who also wrote the special introduction to the Barker Index which explains its use to chemists with no previous training in crystallography.)

The essential preliminary problem

So a new weapon has been added to the chemical analysts' armour. It is a limited weapon in that it is only of use for identifying crystals which someone, somewhere, has already analysed by other means: finger-prints will not reveal a criminal's identity until *someone* has caught him and finger-printed him. But they are very useful for all that, and so is the Barker Index.

As a matter of fact, it is often possible to discover the composition of an entirely unknown substance by examining crystals of it, but only by using X-rays to "get inside" the crystals, as it were. And X-rays can also be used to get "fingerprints" of a kind too—but that is another story.

One way and another, though, it does seem as if there is a pretty good future for the scientist in crystal-gazing.

THE NEW METALS

(Contributed by Metals Division)

The atomic and jet age calls for fresh standards of performance in metals. A whole range of metals hitherto no more than laboratory curiosities—zirconium, beryllium, hafnium, vanadium, niobium, tantalum, germanium and rhenium—are now on the fringe of commercial production. These names are the vital "backroom boys" of the metals world.

Of the hundred-odd chemical elements which exist in the earth's crust about eighty are classed as metals. But by and large industry uses only about a dozen metals —iron, copper, aluminium, tin and zinc are ones that leap to the mind.

In recent years, however, more and more attention has been paid to the "new" metals. Although many of these have unusual names and may not be widely known, most of them have been known as laboratory curiosities for many scores of years. But they are still new in the technological sense, for only in the past few years have attempts been made to produce them as pure metals on anything more than a laboratory scale.

What are the reasons for this growing interest in the new metals? The reason currently claiming most publicity is the world-wide effort to produce commercial electric power from nuclear fission. This has brought such names as **uranium, plutonium,** thorium, zirconium, beryllium, hafnium, vanadium and **niobium** into the news.

The most vital of the nuclear metals are uranium, plutonium and thorium, for these are the nuclear fuels. Of these, **uranium** is the most widely used at the present time and is the fuel of the Calder Hall nuclear power station. Plutonium is formed from uranium during nuclear fission and in time will undoubtedly be used in some types of nuclear reactor.

Thorium is not directly capable of nuclear fission, but it is readily converted to a fissionable form of uranium and will therefore serve to supplement our reserves of uranium. In contrast to uranium and plutonium, which do not find any real application outside the nuclear energy field, thorium will probably be used more and more as a strengthening addition to magnesium; the oxide, thoria, is still used for gas mantles and, as an offsetting demand for this declining industry, for grain size control in tungsten filament lamps.

Zirconium, beryllium, hafnium, vanadium and niobium are nuclear reactor constructional materials. Their chief potential use is to provide a sheath or "can" of non-fissile metal as containers for the uranium. There are three main reasons for enclosing the fuel in this manner. The first is to contain the by-products of nuclear fission, which are very often intensely radioactive; the second is to protect the fuel from the corrosive attack of the reactor coolant; and the third is merely to support the fuel if necessary.

Just as lack of oxygen will damp down a fire, so a deficiency of neutrons will damp down nuclear fission, and care must be taken to see that as few neutrons as possible go to waste in ancillary components such as cans. **Beryllium** has the lowest absorption for slow neutrons of all the metals, and other factors being equal the nuclear engineer would prefer it to all other canning materials. Other factors are generally not equal, however, and the choice of canning materials (which must take into account the price which the designer is prepared to pay for low neutron absorption) is very difficult.

Although beryllium is used in a number of alloys, it has only come into prominence as a pure metal because of its use in reactors. It is a very rare metal and is also, generally speaking, very brittle and difficult to work. In certain forms, but particularly to certain people, it is also highly poisonous and has to be handled extremely carefully. All these drawbacks make it very expensive.

A term frequently used when discussing the merits of a metal for use as a can is its compatibility—its ability to exist in contact with another metal without interaction, either physical, chemical or metallurgical. Resistance to corrosion is one facet of compatibility. **Zirconium,** because it resists both attack by neutrons and corrosion in hot water, was used as the fuel sheathing in the American nuclear submarine *Nautilus* (it was also, in fact, used as part of the actual fuel itself, to dilute the uranium).

As reactor operating temperatures are increased, liquid metal coolants must be used instead of water. Among the new metals with low melting point, **bismuth** and **gallium** have been mooted for this purpose, but sodium (or a sodium-potassium alloy) is perhaps the most favoured at the present time. Fortunately most canning materials resist liquid sodium quite well. Equally important is the resistance of the canning material to alloying with uranium, for it matters little whether a burst can result from perforation by the coolant or by the fuel. The most resistant metal to uranium is probably tungsten, followed by tantalum, niobium and zirconium.

. . . a brief picture

Nuclear reactors are controlled by the regulated absorption of neutrons. In other words, you insert rods into the reactor to absorb surplus neutrons, thus damping down the reaction, and when you remove part of these rods you absorb fewer neutrons and therefore increase the reaction. Obviously what is required for this purpose is a material which will absorb neutrons freely.

Hafnium is one such metal. It is found up to about 2% in the naturally occurring zirconium mineral zircon, and is, in fact, a by-product of zirconium production, since it is removed in the process of making zirconium suitable for use in the fuel element. Unfortunately the chemical properties of the two metals are very similar, which makes it difficult to separate them and adds considerably to the cost of reactor-grade zirconium.

This is a brief picture as far as new metals in nuclear energy are concerned. Until the advent of this new industry perhaps the most important, and still a very important, pacemaker for metallurgical progress was the aircraft industry.

The principal need here is simply high-strength materials with low density, whether the materials are required for use in the airframe or in the gas turbine. **Titanium,** of which I.C.I. is the largest producer outside the U.S.A., may be classed as a new metal. Already this metal is being quite widely used in airframes and in parts of the compressor of certain engines.

In spite of its high melting point, however, titanium has poor creep resistance at the operating temperature of the turbine, and the search is still on for a super-alloy capable of better performance than the alloys used at present. **Molybdenum** has so far been the subject of most effort. This metal has for many years formed a minor but vital constituent in some steels, and the pure metal has also been used in some electronic devices.

The chief difficulty in exploiting the excellent creep resistance of molybdenum in gas turbine rotor blades lies in its very poor resistance to oxidation. Considerable progress has been made in other sectors of molybdenum technology, but the oxidation problem is still unsolved.

Two other metals with possibilities in this field are **niobium** and **massive chromium.** Chromium is already used in a wide range of alloys, and also, of course, as electroplate. But the attempts being made to widen its technology and exploit the properties of the pure, massive metal put it in the ranks of the new metals. Normally, pure chromium is very brittle, but some progress is being made on a laboratory scale in increasing its ductility.

The electronics industry, although it is a small user, is an important one and a potential outlet for new metals. **Germanium,** used for crystal diodes and transistors, is perhaps the best known of these, and it obviously has a great future. Among the precious metals platinum and rhodium are used in thermocouple elements and electrical contacts. **Tantalum** is used in certain electronic valves and electrolytic capacitors, while titanium and zirconium also find limited uses based on their gettering properties.

. . . put it in the ranks

The latest metal to excite interest among electronic engineers is **rhenium.** This has a melting point of over 3000° C. and a low vapour pressure, and in some ways is better than tungsten. It is already commercially available in the U.S.A., and its uses may be expected to increase.

Exploitation of the excellent corrosion resistance of many of the new metals is greatly hindered because they are expensive compared with existing conventional materials. Many, for example platinum and tantalum, are already used under conditions of service where little else is satisfactory. Zirconium might well compete with tantalum, but the really wide application of new metals in chemical plant must await either a fall in price or acceptable means of offsetting their high price—by cladding, for example, or by completely new plant design.

These are but a few of the new metals; many more remain to be explored, and their future is an exciting one.

Garden Notes

By Philip Harvey

Illustrated by Sheila Waters

In some districts, especially on light soils and in dry weather, carrot fly can be a major pest, and unless preventive measures are taken the crop may be scarcely worth growing. On my heavy land carrot fly gives relatively little trouble, but I cannot grow the long exhibition specimens which usually come from deep, sandy soils. Nevertheless I am quite content, as I am not a carrot enthusiast and eat this vegetable mainly because I have read somewhere that it is good for one's eyesight!

To return to the carrot fly. The larvae develop from eggs laid under the soil near the roots. They burrow into the roots, which assume a rusty appearance. Reddening of the foliage is a typical sign of damage, as well as the collapse of young seedlings. The larvae may be found in the damaged roots, which should, of course, be burnt.

The old rule that root crops, particularly carrots, should not be grown on *freshly* manured ground still holds good. The operative word is *freshly*, because fresh animal manure may cause carrot roots to fork and the carrot fly seems to thrive on recently manured land. Well-rotted manure is another matter, provided it is distributed evenly throughout the soil.

The carrot fly is also attracted by the smell of crushed foliage. Always sow as thinly as possible, thereby reducing the need for singling, a job which should be tackled when the soil is moist. (Water, if necessary, beforehand.) Burn the thinnings and firm the soil by treading both sides of the rows, otherwise the loosened earth will provide a convenient place for the fly to lay its eggs.

The first generation occurs in late May and June, and early-sown carrots are easily attacked. A second generation appears about mid-July, and in some seasons attacks may persist until early autumn.

Cultural measures rarely suffice to keep down the carrot fly and an up-to-date chemical treatment is the most practical answer. 'Abol' Gamma Dust applied along the rows when the carrots make their first rough (true) leaves is a standard remedy.

Like cauliflowers, Brussels sprouts require a long season of growth. They are probably at their best on fairly heavy land, where an abundance of close-set sprouts can be often obtained without much trouble. Perhaps this is a dangerous statement, because they are a crop that wants "doing well." However, given a rich, firm soil to begin with and one which does not readily dry out, you are more than half-way to success. Very light soil needs generous initial preparation, as far ahead as possible. Compost, hop manure, well-rotted farmyard manure plus bonemeal and sulphate of potash will all help.

Do not delay the planting out of March sowings of Brussels sprouts and make sure they are properly hardened off if sown under glass. Textbooks sometimes recommend planting the larger varieties 3 ft. apart; 2½ ft. is probably sufficient in most cases, allowing about 2 ft. between rows. Where the garden or allotment is very exposed the taller varieties should be staked before winter sets in, the stake being on the windward side.

Early May is the time for outdoor sowings of half-hardy annuals like Asters, Ageratum, Nicotiana, Petunias, Salpiglossis and Schizanthus. I must emphasise that the term half-hardy annual is a horticultural and not a botanical expression and should not be taken too literally in some instances. For example, Ageratum, which is commonly treated as a half-hardy annual, is really a half-hardy perennial.

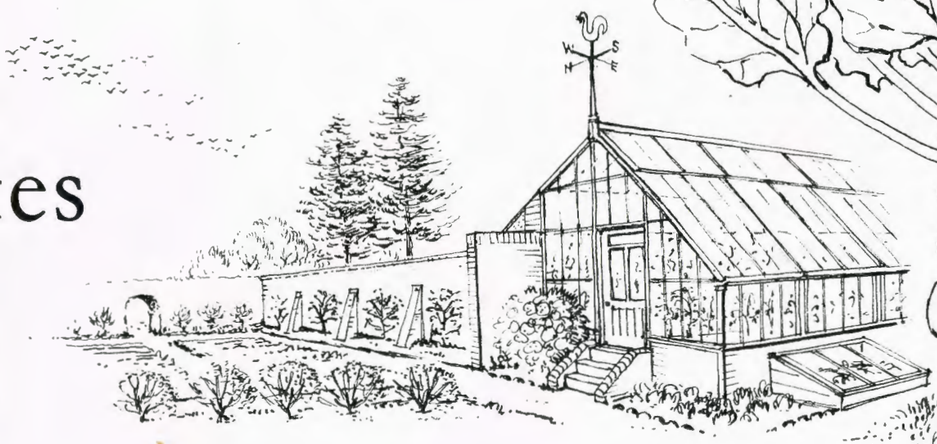
Ageratum makes an excellent edging to rose beds, although inclined to become invasive on light, wet soils. (Self-sown seedlings are common in warm summers.) Blue and white are the main colours, but there is a variety called Fairy Pink which the catalogues describe as soft salmon-rose. It is really more of a pinkish mauve—in my garden, anyway!

A gamma-BHC spray such as 'Sybol' is the most economic answer to aphids, liquids being preferable to dusts for these pests. Remember to spray both sides of the foliage, as aphids, in common with thrips, leaf hoppers, etc., are also found on the undersides.

A mulch of lawn mowings or damp peat will help to keep the rose roots cool, especially in dry weather. The claim that mulching assists in keeping down black spot is very difficult to substantiate, and preventive spraying with a thiram fungicide such as 'Tulisan' is imperative if this disease is to be checked. A wet summer encourages black spot, as the foliage need only be continuously wet for six hours for infection to develop.

Mulching is also stated to arrest the development of powdery mildew, but as with black spot there appears to be no confirmatory scientific evidence. Sudden temperature changes, especially when cold nights follow warm days, are especially favourable, similarly a humid atmosphere. Dry weather is necessary in the first instance to help disseminate the fungus spores, and in a dry summer mildew is usually more serious.

Generally speaking, roses with glossy dark green foliage are less prone to mildew than those with light green, soft leaves. However, in a season which is highly favourable to the disease, few of the varieties normally termed resistant will escape some traces of infection. Preventive spraying with a thiram or wettable sulphur fungicide will keep down mildew, this treatment being repeated as necessary throughout the season.



Penguin Island

By Peter Tenni

Colour photographs by the author

In the intervals of collecting geophysical information on a remote island in Antarctic seas the author found time to observe local wild life—penguins, the almost legendary albatross, and elephant seals which sometimes weigh as much as five tons.

Antarctic work study. *These Genton penguins have the habit of wandering up to a man at work and subjecting him, and the work, to a critical inspection.*

In March 1953 the Norwegian sealing ship *Tottan* left Melbourne with fourteen apprehensive men aboard. They were the relief party for the scientific station at Macquarie Island, a small island about twenty miles long by three wide, some 800 miles S.S.E. of Tasmania.

Each year the Australian National Antarctic Research Expedition sends a party to Macquarie Island to make scientific observations in meteorology, geomagnetism, biology and other natural sciences. The team in which I found myself as geophysicist consisted of fourteen men of widely differing occupations, ranging from a psychiatrist to a cook from a Murray River paddle boat.

After a rough six-day voyage through the "Roaring Forties," we anchored early one morning about half a mile from the coast of a desolate-looking island. The first task was the unloading of a year's stores—food, clothing, equipment, and over a hundred drums of diesel fuel. All this had to be put on to rubber pontoons and towed by ship's motor boat to the edge of a reef. From there the pontoons were hauled ashore by rope and the stores unloaded on to sledges, to be towed to the dumps by tractor.

We newcomers were overawed by the heavily bearded veterans of the year before. They worked like Trojans, while we sought every opportunity to huddle in corners to shelter from the biting wind. After a brief familiarisation course and a wild party (known as a "ding"), the ship sailed away, leaving us in sole possession of our speck of land.

Every night, from sunset to sunrise, one person was on auroral watch. This duty, shared between six of us, entailed examining the sky every fifteen minutes and noting the form and position of the aurora australis, which often appeared as magnificent moving draperies of red and green, covering up to one-third of the sky. Later in our stay a smaller station was set up 20 miles away at the southern end of the island, so that simultaneous photographs could be taken of the aurorae to determine their height and position. This southern station was manned by two men, relieved at fortnightly intervals.

The climate of Macquarie Island, which lies just north of the Antarctic Convergence, is not as extreme as might at first be thought. The temperature never dropped below 20° F. but never rose above 50° F. Wind and (in summer) damp tried us most. One month the average wind velocity was over 25 m.p.h. and the daily average hours of sunshine were nil.

In fine weather we observed wild life. The island is a home to millions of penguins and to tens of thousands of seals, as well as albatross, tern and other birds.

Of the four species of penguin we met, by far the most impressive were the king penguins. About thirty inches tall, they have grey and white plumage with brilliant yellow marks about the throat and beak. They live now in only one "rookery," about fifteen miles south of the camp. Once there were several large rookeries, but they were wiped out by the sealers, who used the oily carcasses as fuel for the boiling-down process.

The king penguins are most amusing when incubating their eggs. Both the male and female bird take turns in incubating the single egg and keep it warm by a flap of skin which folds down from their abdomen. If the egg is stolen, they will solemnly "incubate" a round stone or a tennis ball. The newly born chicks are covered with thick brown down and remain so covered for a year, when they weigh more than an adult bird. When the chicks are a few months old, most of the parents swim away for seven or eight months, leaving only a few birds behind to feed all the chicks. On the return of the main group of penguins the "nursery maids" and the now feathered chicks take a year's holiday at sea.

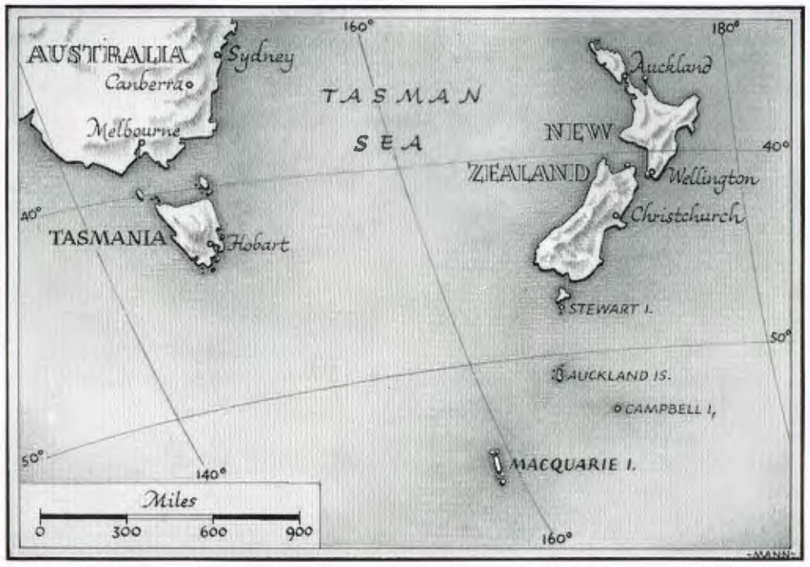
The royal penguins are quite different. They congregate in large, very noisy rookeries, the largest containing over three-quarters of a million grown birds. They rear their chickens in the usual manner, both adults and chickens leaving the island at the same time. These penguins spend about eight months of each year swimming in the open sea.

The albatross interested us a lot. Wandering albatrosses, the species made famous by the Ancient Mariner, nest in the open on lonely beaches, while the smaller and more graceful sooty and black-browed albatrosses nest on rocky cliffs. These latter species, about the size of a goose, are very tame and can be stroked sitting on their nests. It is advisable to wear heavy gloves when doing this, as a nibble from their razor-sharp bills can—and did—gash a hand severely.

The stony beaches near the camp were the favourite breeding ground of elephant seals. These monsters, up to eighteen feet in length and five tons in weight, come ashore in the spring. The bulls fight bitter battles for possession of the herds of cow seals, which arrive a short time after the bulls. Each bull controls a "harem" of cows, between five and fifty in number. Sometimes four or five strong bulls will combine to control a group of over 200 cows. These bulls will not fight among themselves but will do battle with any intruder.

Other, perhaps more placid, bulls select a quiet cove or isolated stretch of shingle and live in a cosy domestic group with less than a dozen cows. Even though a bull is firmly established in possession of his cows he is likely to be challenged by another and if beaten is driven back to sea, from which he emerges to challenge still another bull.

The newly born seal pups are covered with black hair, but they soon lose this and acquire a smooth shiny grey coat of coarse hairy fur. They are quickly deserted by their parents and then form into groups which splash about in the shallow water, teaching themselves to swim. These youngsters, known as "porkies" because of their corpulence, became a nuisance round the camp, grunting and squealing under sleeping-hut windows and tripping us up at night. In the end we had to build a fence round the camp area to keep them out.



One of our most arduous tasks was branding these pups, so that their future wanderings might be recorded. The job took five men, four holding down 150 pounds of wriggling seal while the fifth applied a red-hot iron. Seals branded at Macquarie Island have turned up at other islands in the South Pacific, hundreds of miles distant.

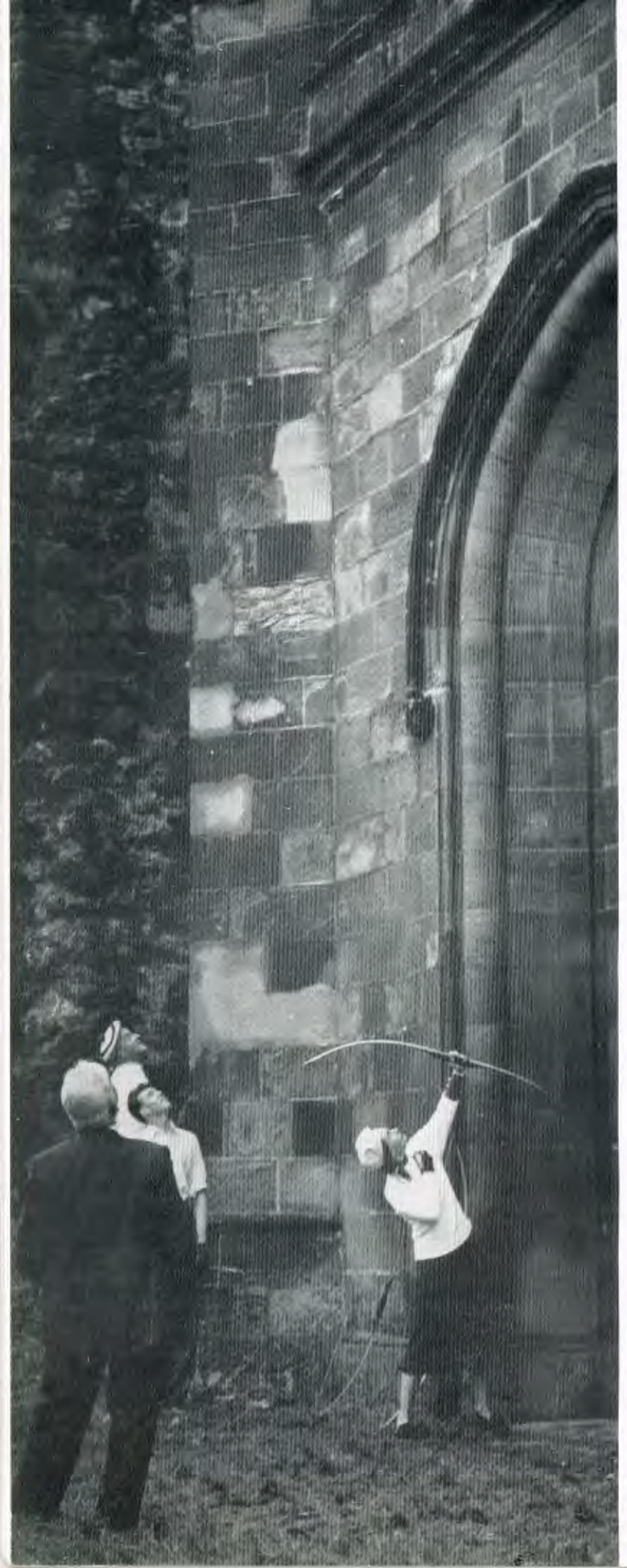
The fur seal, of which there used to be thousands, no longer breeds on the island, because of the activities of the sealers in the early 1900's. However, more fur seals are seen each year, and it is hoped that soon they will breed there again.

Say "Ah"! *A yearling elephant seal exhibits his tonsils in an attitude of defiance. Later he will develop the trunk-like proboscis which is the reason for his name.*

Plenty of work and a share of fun made our year pass quickly. The middle months seemed to drag a little, and most people became a little edgy. But the news that the relief ship was to arrive two months earlier than expected bucked us up. Huts had to be painted, stocks checked and reports written, so that time passed quickly.

Finally the great day arrived. Typically, it was a foggy morning and we were unable to see our ship. When finally the fog lifted, there she was, not the *Tottan* but the Danish Polar ship *Kista Dan*, which to us looked as large as the *Queen Mary*. The unloading was easier this time, as the army had sent two DUKWs. They came ashore under their own power, pumped up their tyres at the beach and drove to the store dumps. It was our turn now to criticise the new arrivals, and we thought them totally unfit to take over and maintain the station for the next year.

Obviously we were wrong, as the Macquarie Island station has continued to expand and now is one of the major stations for the collection of scientific data for the forthcoming International Geophysical Year.



MASSIVE fragments of crumbling walls, some arched gateways, the ruined gable of an abbey grouped close to the tall square tower of the town steeple—these grace with antiquity Kilwinning in Ayrshire. Otherwise the ancient origin of that town is not betrayed to the traveller.

This group of masonry is a landmark readily seen from the taller buildings in the Nobel Division's Ardeer Factory, whose boundary runs near the town of Kilwinning. Part of Ardeer lies within the parish of

Shooting The Papingo

By Harry Hutchison

At Kilwinning in Scotland archers assemble once a year to shoot—or shoot at—a wooden papingo fixed to the top of the church tower. A 300-year-old tradition is thus now revived.

Kilwinning. Many Ardeer men and women live in the town and respect its traditions, especially that of an archery tournament of unique character which is now held every year.

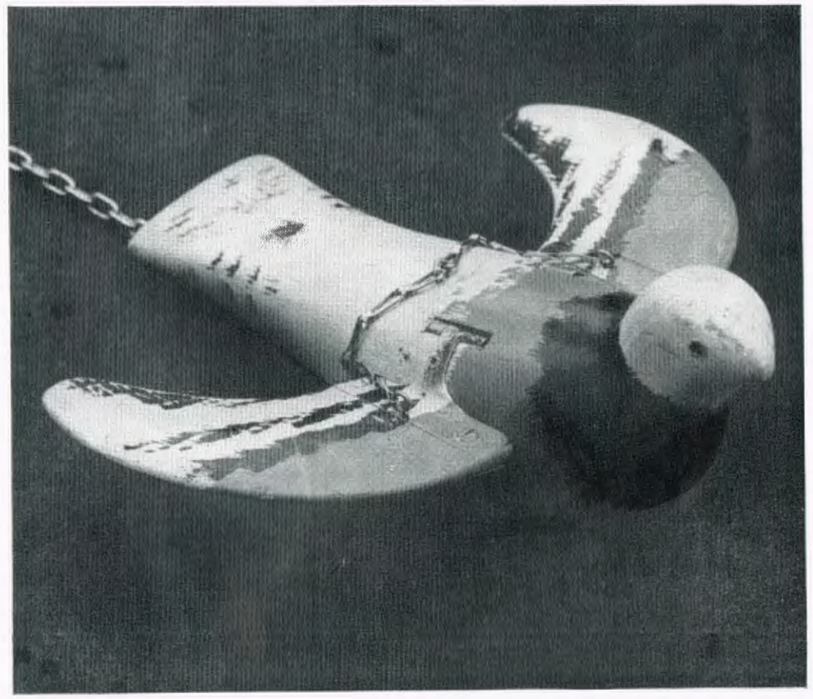
The Papingo Tournament was revived in 1952. For 82 years the shoot had not been held, but recollections of its incident, excitement and colour were fresh in the minds of Kilwinning's oldest inhabitants. Some possessed relics of a tournament which until 1870 had been held every year with scarcely a break since 1688. In that year the Ancient Society of Kilwinning Archers was re-formed "in order to the restoring of the ancient sport of the papingoe formerly practiced in this place."

Kilwinning Arrow, *on which hang the medals of the archers who have struck the papingo each year from* 1724 *to* 1866

"The papingo was a wooden bird made to resemble a parrot, alike in shape and colour. The wings were loose, and the apertures in which they were stuck in the sides of the bird were wide, so that they readily fell out when struck. The wooden parrot was fixed to the end of a pole, which was laid out on the top of the only remaining tower of the once grand Kilwinning Abbey so that the bird was about ten feet from the tower—one hundred feet above the marksmen, who had to aim perpendicularly from the base of the tower.

"At the beginning the bird was firmly fixed to the end of a pole, with wings spread out, and consequently at this stage the archer could only touch it or, at best, bring down a wing. When, however, the shooting was for the great honour of being captain of the papingo, the bird 'was made louse for shooting af' and a comparatively slight touch could 'ding her doon.' "

This concise description of the tournament was written about 1880, some nine years after the last shoot. There was no expectation then that the tournament



Wooden papingo, *the target on the church tower at which the archers shoot*

would ever be revived, and not until the rebirth of interest in archery after the second world war, which resulted in re-establishment of Kilwinning's Ancient Society, was any thought given to restoring the tournament.

The restoration was a triumphant success, and since 1952 there has been a shoot every summer. On a Saturday in July (usually the first Saturday) archers compete for the captaincy of the Kilwinning Society by shooting at the butts, where each releases a round of 72 arrows at 30 yards directed at a Kilwinning nine-inch target. The winner becomes captain, and has a medal bearing his name hung on the Kilwinning Arrow, a handsome old trophy which during the years of inactivity was kept in Archers' Hall, Edinburgh.

In ancient days the Kilwinning Arrow was a trophy which rewarded the man who shot the papingo, but when the society was re-formed the decision was made to keep the arrow for the more scientific performance at the butts and give only a medal for the papingo winner. The evening after the captain's shoot, archers of the society assemble in the kirkyard of the old abbey to shoot at the wooden popinjay, similar in dimensions and pattern to an old model but of improved mechanical design. It is attached to the end of a pole, which is now projected from the top of the town steeple, more than a hundred feet overhead.

The first step at the steeple doorway is the shooting position, and the arrow is released vertically. Viewed from the ground, the target is a black patch less than pigeon size against the summer evening sky, and even the most skilful archer knows that to strike it fairly needs much luck as well as good marksmanship. The spectators look for more William Tell performance than is ever produced.

Each archer in turn walks to the step. Each bends back to sight the target overhead, nocks the arrow, pulls the bow, and releases the missile in its vertical flight. After the arrow is released, the archer joins the end of the queue to await another chance. The tournament continues until one arrow strikes and the birdshape is dislodged to dangle at the end of its tether.

Accuracy is difficult to achieve. A still evening is best, but this condition is rare. Most often there is at least a breeze, and wind drift is difficult to gauge. Although during part of the flight masonry shelters the arrow, as the target is approached the arrow is exposed to air currents. Near misses (and misses which are very wide) are always more common than direct hits. Yet I have seen the papingo struck in the first dozen shots. I have also waited until dusk was falling and hope almost gone before success came after more than two hundred attempts.

Despite uncertainties, complete failure is rare, and so unusual is this shoot and its setting, so remarkable the contrast between the colourful archers in the kirkyard and the narrow bus-thronged thoroughfare nearby, that interest remains unquenched.

The archers nevertheless are not dressed as brilliantly as were members of their society a century and a quarter ago, when they marched splendidly in "double-breasted green longcoat with gilt buttons, the coat to be lined with white silk, the buttons to be made with cross arrows; the pattern coat and vest to be seen in the possession of the secretary."

The present dress is contemporary, but it has a hint of the past. The Stewarton bonnet worn by the archers is off-white in colour, bound with green ribbon, and ringed to resemble an archery target. It is based on an original about a hundred years old, but the size is reduced with some gain of elegance. Green slacks and white shirts are worn.

So dressed, the group of archers makes a bright centre to the half-circle of spectators some thirty yards distant. Set in the grass are the horizontal tombstones of past ages, and there are pit-marks on the surfaces of many stones. These marks were made by falling arrows last century and earlier.

The spectators in those days were in more hazard than is permitted today. As unprotected arrows were released the spectators were warned with the cry "Heads! Arrows!" There is no record of disastrous accident in the society's archives.

Before the tournament was formally revived in 1952, archers demonstrated before the magistrates of Kilwinning and the police. For safety's sake the arrow points were covered with short sleeves of rubber tubing, and therefore if a descending arrow strikes stone it bounces and is easily caught. I have not seen one hit any head. Often the arrows go astray and fall in apparently inaccessible parts of the ruined abbey, but small boys who are as sure-footed as they are capable of evading the police scramble over the ruins and retrieve the missiles.

All this and more builds atmosphere as the swallows screech through the ruined arches and soar into the blue of the sky. The crowd watches with the archers and sighs or cries "Oh!" as the arrows miss.

To my mind, however, one thing is missing. It would have been better to restore the entire tradition and award the prize to the winner of this ancient tournament. On the magnificently beautiful Kilwinning Arrow hang the Papingo winners' medals from 1724 until 1866. The winners of the twentieth-century tournament do not have their medals hung, and the trophy is the reward for another kind of competition.

On 9th June 1951 the town of Kilwinning watched a ceremony of splendid ancient dignity. In the public park archery targets had been erected, and on the green field, its surface dappled with leaf shadows, an empty table stood. Grouped round the table were the Earl of Eglington, the Provost and magistrates of Kilwinning, and many hundreds of spectators. They awaited the formal return of the Kilwinning Arrow, which for so many years had been in Archers' Hall, Edinburgh, in the custody of the Royal Company of Archers, the Queen's Bodyguard in Scotland.

This splendid silver trophy, glinting and shimmering as the sun struck from the silver medals of past papingo winners, was escorted through the streets of Kilwinning by a full detachment of the Queen's Bodyguard for Scotland led by their piper. These members of the Royal Company, tall men all of them, wore their ancient field uniform. To the empty table and the waiting local dignitaries they carried the trophy into which so much of Kilwinning's archery history had been worked.

The trophy is a silver crossbow supported on crossed silver arrows. Hung on the arrows and the bow are silver medals and one gold medal. The trophy is not all of one age. The oldest part, the original Kilwinning Arrow given to the society in 1724 by a Mr. David Muir, also bears his name on the first medal.

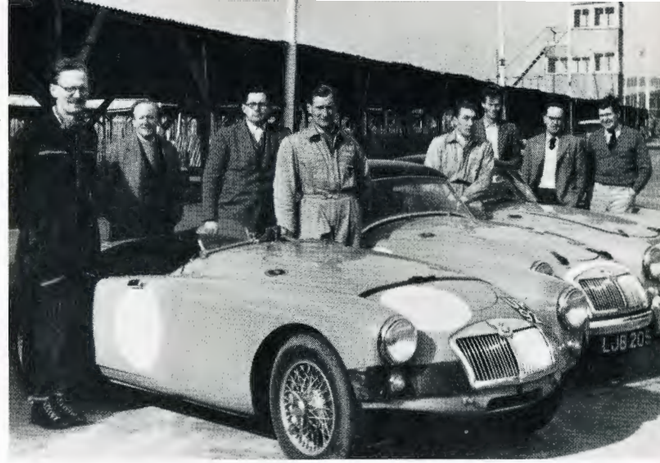
It was not long before the first arrow could carry no more medals, so new medals were merely stored beside the overcrowded arrow. In 1845 the committee considered this problem and a decision to acquire a new trophy was made. When the new trophy did come, fourteen years later, it was the Kilwinning Arrow in its present form. A gold medal was added by the captain of the papingo in 1860. Ten years later the tournament was discontinued, not to be revived for eight decades.

NEWS IN PICTURES

First aid winners. *A team from Gaskell-Marsh Works of General Chemicals Division won the final of the I.C.I. first aid competition. Seen here with the trophy are Messrs. N. Waite, F. Beswick, J. Ford (captain), E. Twigg and D. Connolly. Runners-up were Hillhouse, Plastics Division*

Boys *in the school cob*
soles on shoes. Wear tr
'Butakon' rubber reinfo
will be on show at the
Division at Wilton, and

bler's shop at a Hertfordshire technical school putting 'Butakon'-based
als revealed that a 'Butakon' sole outlived three or four leather ones.
cing resins and 'Melinex,' a tough, transparent polyester packaging film,
B.I.F., Birmingham, this month. 'Butakon' is produced by Plastics
'Melinex' is at present being made in pilot plant quantities at Welwyn



Central Work Study Department's *racing motorist, Mr. John Blaksley, is a member of the new M.G.A. team entered for the Italian road classic, the Mille Miglia, which starts on 11th May. Above: the team at Goodwood. Mr. Blaksley is third from left. (Photo: J. Brierley)*

Fifty years with the Company *brought a personal letter from the Chairman for Instrument Artificer Chris Johnson, photographed above in the Instrument Shop at Winnington Works with Messrs. Green, Shaw, Robinson and Nimmo*

First aid—2. *Among the spectators at the competition, which was held in the basement of Imperial Chemical House, were Lord Waverley, a director of I.C.I., Mr. S. P. Chambers, a deputy chairman, Dr. Glyn Hughes, president of the Casualties Union, and Dr. A. J. Amor, chief medical officer of I.C.I.*

First aid—3. *A team test in full swing. The team f*
from scaffolding while repairing an
om Hillhouse (Plastics Division) is attending to a man who has fallen
acid main. He has acid burns and a fractured pelvis

Free week's holiday *at any holiday camp in Britain was the prize for Billingham skiffle enthusiasts John Donelly, Andrew Wood, Kevin Minnighan and Lance Vernon, judged the best skiffle group in the North-east at a recent Middlesbrough competition*

Meal breaks *mean chess time for the men of Ardeer's Blasting No. 1 Unit. Matches often take as much as a week to complete. Our picture shows Messrs. Swindle, Boyd, Conti and Erskine at play*

Northwich gen **erosity.** *£140 to buy a pa tent page-turning device for polio patient Mrs. Ruth Birtwistle, wife of a Wallerscote cost cl erk. The fund reached £260—enough to buy a TV set as well. In the picture above Mr. John Foster (centre), M.P. for Northwich, is presenting the page-turner and TV set to Mrs. Birtwistle in the hospital where she has been in an iron lung for nine years. Mr. Birtwistle is on the right*

Doomed. *A new Plant Protection product, 'Tetram,' provides the first completely effective answer to red spider (shown above, greatly enlarged), rust mite and scale insects on fruit, citrus and cotton crops. Top picture shows damage to grapefruit by scale, which can now be controlled by one application of 'Tetram' a year*

Winning entries *from Lime Division's last safety poster competition were submitted to the Royal Society for the Prevention of Accidents. One of the posters, submitted by Mr. G. R. Grundy, has now been accepted by ROSPA for circulation in a modified form (above, right) to firms throughout the British Isles*

Pressure cooking *is the secret behind the pleating of 'T The fabric is laid between two pleated cardboard formers and concertina strip ready to go into the pressure steamers for he takes about ten minutes*

erylene' skirts. Above, left: folded by hand into a tight at setting. Setting operation

Spring *at Wilton. A recent picture of the Castle taken from the south. Sheep are from Wilton's Bank Top and Court Green Farms*

PICTURES FROM OVERSEAS

Kenya. *When I.C.I.'s chief medical officer, Dr. A. J. Amor, visited Magadi he was photographed with the staff of the Magadi Soda Company's hospital. The hospital serves* 2000 *Europeans, Africans and Asians. (Photo: Gian Singh)*

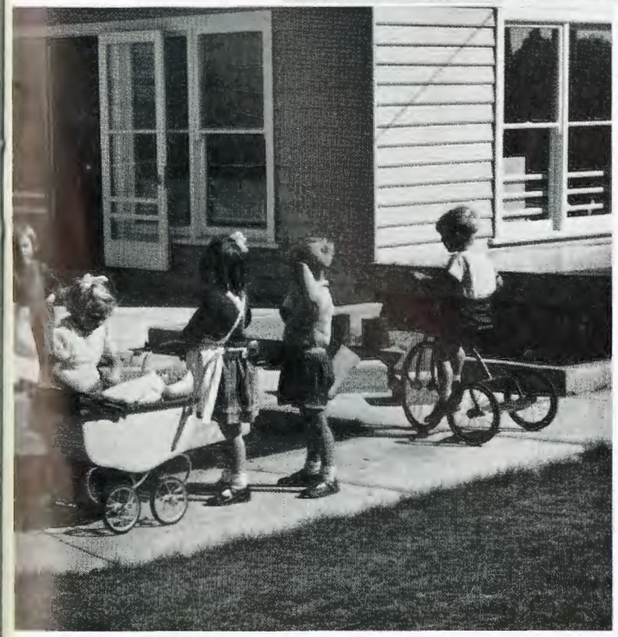
S. Rhodesia. *This picture of a coffer dam in the Kariba Gorge was taken shortly before Zambesi floodwaters completely submerged it and threatened construction work on the £80 million Kariba dam. A.E. & C.I. (Rhodesia) have been supplying* 1200 *cases of dynamite a month for tunnelling work connected with the dam*

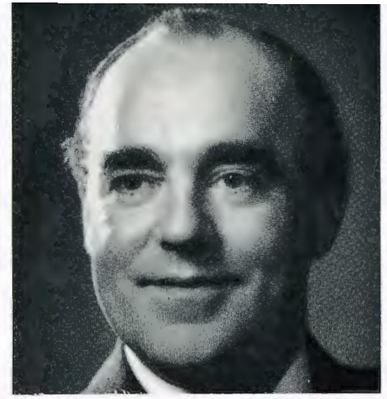
Australia. *The new*
Circular Quay, Sydn
P.V.C., 'Perspex,' 'Vy
used extensively in

I.C.I.A.N.Z. office block on
ey, is nearing completion.
nex' and 'Terylene' will be
the interior decorations

Australia. *The plaque*
children's play centre
Park Factory. The ce
land given by I.C.I.A.
outdoor equipment bo
Billin

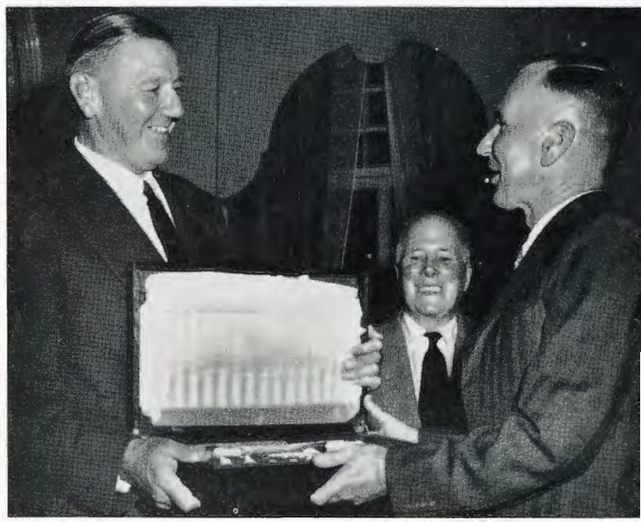
shown on the right appears in a
near the I.C.I.A.N.Z. Deer
ntre, shown below, was built on
N.Z. and the furnishings and
ught with £A400 collected in
gham Division





Mr. J. M. Wollaston *has been appointed manager of the newly formed West African branch of I.C.I. (Export) Ltd. He was formerly deputy head of African Section at Head Office*

Mr. E. Parker, O.B.E., *a director of I.C.I. (India) Private Ltd., has been elected president of the Bombay Chamber of Commerce for the year* 1957–58



S. Rhodesia. *Mr. K. W. Spilhaus (right), managing director of A.E. & C.I. (Rhodesia), received a long service award from the chairman, Mr. J. F. Voelcker, recently. With them is Col. Sir Ellis Robins, a director of the parent company*

I.C.I. NEWS

GASKELL-MARSH WIN FIRST AID TROPHY

THE Gaskell-Marsh Works of General Chemicals Division won the I.C.I. First Aid Competition on 14th February. Runners-up were Hillhouse (Plastics Division).

Sir Ewart Smith presents the I.C.I. First Aid Trophy to the captain of the winning team. (*More pictures on page* 168)

In this year's competition more emphasis was placed on the individual tests, and the time allowed for each was increased from five minutes to eight.

As ingenious and well-staged as ever, these tests called for high standards of first aid, and one at least called for what might be termed first-aidmanship. This was the test in which a burglar was found with his foot trapped by a heavy safe he had been trying to rob. His foot was badly crushed and he was suffering from toxic shock, but the policeman who arrived on the scene after the first-aider was less disposed to help him than to take endless particulars. Magnificently played by Mr. Page, a member of H.O. and Regions Staff Department, the policeman was willing to lend his overcoat and to telephone messages "if mollified." Providing the mollification was, as the judge put it, a useful exercise for the first-aider in putting his personality across.

The team test concerned a man who had been repairing some acid mains at a chemical works—obviously not I.C.I.'s, as the proprietors had neglected to comply with the legal regulations, apart from displaying an illegible copy of them alongside the pin-ups in the loading bay office. The repair scaffolding collapsed, fracturing an acid pipe, and the man suffered extensive burns and a fractured pelvis. An innovation in this test was that the team captain arrived first and was left to sum up the situation before summoning his team.

Dr. J. Gwynne Morgan, chief medical officer of the Mond Nickel Company, judged the team test. The Buxton (Lime Division) team won top marks for the team test and came in for special praise for their handling of such a "chemical" situation.

Dr. D. R. Thompson, principal medical officer of the de Havilland Aircraft Company, and Dr. A. H. Jones, division medical officer of British Railways, Southern Region, shared the judging of the individual tests.

Sir Ewart Smith, a deputy chairman of I.C.I., presented the trophy to the winners and prizes to the first three teams. He praised the arduous work and training undertaken by all the 106 Division teams that had entered the competition and urged the first-aiders to imbue as many of the younger generation as they could with their enthusiasm.

Team	Team test (200 marks)	Individual tests (200 marks)	Combined tests (400 marks)
1. General Chemicals (Gaskell-Marsh)	153	162	315
2. Plastics (Hillhouse)	169	120	289
3. Lime (Buxton) ..	177	107	284
4. Salt (Winsford) ..	141	135	276
5. Alkali (Winnington)	130½	142	272½
6. Dyestuffs (Trafford Park)	148	122	270
7. Wilton (Bain) ..	145	120	265
8. Metals (Kynoch) ..	131	132	263
9. Paints (Slough) ..	113	134	247
10. Leathercloth(Hyde)	107½	136	243½
11. Billingham (Casebourne)	118½	124	242½
12. Nobel (Ardeer) ..	112	114	226

PLANT PROTECTION DISCOVERY

A new chemical which kills spider mites on fruit, citrus and cotton crops was announced by Plant Protection Ltd. at the end of March. It is 'Tetram,' an organo-phosphorus compound discovered by I.C.I. chemists in 1952 and developed since then by Plant Protection field entomologists and chemists.

Dr. R. Ghosh

As little as 2 oz. of 'Tetram' applied per acre kills red spider on apples, pears and other deciduous fruit, red spider on cotton, and scale, rust mite and spider mite on citrus fruit. Not only does it kill these pests on one application but its residual effect keeps the crop clean for the rest of the season.

The man who discovered 'Tetram' was Dr. R. Ghosh, D.Sc., Ph.D., D.Phil, F.R.I.C., who came to this country from Calcutta in 1939. He joined I.C.I. in 1949 and has been working on organo-phosphorus compounds ever since.

Under the code name R6199 'Tetram' has been under test since 1954. In this country Plant Protection field entomologists sprayed it on apple trees in twenty different orchards affected by red spider. Others went to Texas and California and tried the effect of 'Tetram' on cotton and citrus crops and came back convinced that it would in every way fulfil its promise on red spider. Other experimental work was carried out in France, Cyprus, the Lebanon, Holland, Italy, Denmark, Argentina, Uruguay, Chile, Mexico, Brazil, Australia and Japan.

'Tetram' is poisonous and government permission has to be obtained in most countries before it can be used. This has already been granted in the United Kingdom and Holland, where it will be used on apples and pears this season, and in the U.S.A. permission has been given to treat at least 10,000 acres of cotton. It is expected that permission will be granted during the next year to market 'Tetram' in most of the major countries of the world.

NEW ROYAL SOCIETY FELLOWS

Among the 25 new Fellows of the Royal Society elected at the end of March were Sir Ewart Smith, a deputy chairman of I.C.I., and Dr. F. L. Rose, research manager of Pharmaceuticals Division.

Sir Ewart Smith

Dr. F. L. Rose

NEW APPOINTMENTS

Some recent appointments in I.C.I. are:

Metals Division

Mr. J. R. Crane. Titanium Production Manager.
Mr. W. H. Hodgetts. Production Manager, Metal Production Section B.
Mr. J. F. Mills. Factory Manager, Titanium Plant, Waunarlwydd Works.

Nobel Division

Dr. J. Bell. Manager, Silicones Department.
Dr. J. S. Flanders. Manager, Work Study Department.
Mr. R. Haslam. Division Staff Manager.
Mr. G. A. Wilson. Division Labour Manager.

Plastics Division

Mr. W. J. P. M. Garnett. Division Labour Manager.

I.C.I. (Export) Ltd.

Mr. J. M. Wollaston. Manager, West Africa.

I.C.I. (Malaya) Ltd.

Mr. J. B. Wood. Chairman.

Correction: Mr. E. Holmes is Plant Protection Sales Manager for Northern Region, not Southern Region.

Sir Ewart was educated at Christ's Hospital and Sidney Sussex College, Cambridge, where he took first class honours in the mechanical science tripos and was John Winbolt prizeman. He joined Synthetic Ammonia and Nitrates Ltd. (later Billingham Division) in 1923 and became chief engineer at Billingham in 1932.

On his return to I.C.I. in 1945 after war service with the Ministry of Supply Sir Ewart was appointed technical director and in 1955 a deputy chairman. He was knighted in 1946.

Sir Ewart has served on many government and industrial committees. Among those of which he is currently a member are the British Productivity Council (of which he was chairman in 1955), the Committee on Scientific Manpower, and the Northern Ireland Development Council.

Dr. Rose comes from Lincolnshire, and after obtaining a First in Chemistry in 1930 at the former University College of Nottingham he engaged there on a period of research which led to a Ph.D.

He joined I.C.I. at Blackley in 1932 as a member of the azo section research department, and was seconded in 1936 to the small newly formed medicinal chemical section, of which he became section head in 1942. With the creation of the separate Pharmaceuticals Division, Dr. Rose became research manager responsible for the chemical group of the research department.

In 1949 he gained the first D.Sc. awarded by the University of Nottingham after the grant of its charter, and in the same year he received the O.B.E. for his wartime research on antimalarials.

Dr. Rose has been closely associated with the synthesis of a number of drugs, including 'Sulphamezathine,' 'Paludrine,' 'Antrycide' and the new antiseptic 'Hibitane.'

NEWS IN BRIEF

IDEAL HOME ENQUIRIES. Three-quarters of a million enquiries were received at the Plastics Division stand at the Ideal Home Exhibition. Many of them were about 'Alkathene' water pipe and a new 'Alkathene' watering can which will reach the market shortly.

IMPORT SAVER. The polythene factory built at Sydney by I.C.I.A.N.Z. will open late this year. It is expected to save Australia £A1m. a year on imports.

DRAUGHTS CHAMPION. Mr. William McLellan, a boiler fireman at Ardeer, is the new draughts champion of Ayrshire. In a replayed final he defeated Mr. Richard Maxwell, a nitroglycerine hill foreman.

CEMENT RECORD. Billingham Division's Casebourne cement plant achieved record tonnages of cement and clinker last year. The output of cement, 346,467 tons, was 3% of the total produced in Britain.

CUP SEMI-FINAL REFEREE. Mr. Kevin Howley of Dyestuffs Division Nylon Works at Billingham was referee at the Aston Villa–West Bromwich Albion F.A. cup semi-final on 23rd March. When he was put on the Football League list last year Mr. Howley was their youngest referee.

QUEEN'S SCOUT. Patrol leader James Smith of Kilwinning Scout Troop, an apprentice fitter at Ardeer, has received the Queen's Scout Badge.

'TERYLENE' DEMAND. The recent demand for 'Terylene' has been so large, Mr. P. C. Allen, Fibres Group Director, said recently, that I.C.I. is looking for additional supplies from Canadian Industries Ltd.

HAT TRICK. New employees and guests at the Edmonton Works of C.I.L. wear white "hard hats." This enables them to be recognised by the older and more experienced employees, who keep a close watch on them to forestall accidents. The works safety motto is: "Be your brother's keeper."

SHOT-PUTTER. At the athletics match between A.A.A and Oxford University this month Mr. Bill Robins of Billingham Division Staff Department will be putting the shot for the A.A.A. He is also a discus thrower and has represented Oxford University, Yorkshire, the Northern Counties, British Universities and the R.A.F.

FLYER AT PALACE. Mr. R. A. Eeles of African Department, Head Office, was received at Buckingham Palace by the Queen in March, together with some 70 commanding and senior officers of disbanded Royal Auxiliary Air Force squadrons and air divisions of the R.N.V.R. Mr. Eeles was C.O. of No. 615 (County of Surrey) Squadron.

MONEY FOR IDEAS. £5430 was paid to I.C.I.A.N.Z. employees in awards for suggestions in the eighteen months up to December 1956.

DECATHLON AT WILTON. Wilton's athletic section will have a decathlon event this year for six-man teams. There will be eight events: high jump, long jump, discus, shot put, javelin, hop, step and jump, 100 yards flat race and relay race.

CASH CUSTOMER. The 250,000th tube of 'Savlon' to be sold in Australia since May 1956 was bought by Mr. K. G. Begg, chairman of I.C.I.A.N.Z. He paid cash.

TALK DOWN UNDER. Mr. J. C. Swallow, chairman of Plastics Division, gave a talk, "The Significance of Plastics in Modern Economy," to the National Plastics Convention in Canberra on 25th March.

BILLINGHAM DIVISION

Invention speeds Invoices

Brothers Ben and Eric Woodley work together on servicing typewriters, calculators and other office machinery used at Billingham.

Now, also together, they have received a substantial award from the Company for an invention which has speeded up the 1000–1500 a day flow of invoices and consignment notes from the Invoicing Section of Billingham Division Distribution Department.

They were asked if they could suggest a way of using hand-operated enumerators to stamp invoice and consignment numbers on the invoices. Two machine attachments they have made for this purpose have proved a complete success.

Previously three typists were employed full time putting the numbers on the forms. Even then bottlenecks in the invoice flow often occurred. With the new attachments two girls can quickly number all the invoices, the typists are freed for other work, and a special journey of the invoices to the typists' room and back for checking is saved.

Mr. J. A. L. Young, Division Personnel Director, presented the brothers with their award. Their invention may be used by other Divisions of the Company.

METALS DIVISION

To the Rescue

Mr. Jack Bennett, a carpenter in the Wolverhampton Works maintenance department, was recently associated with the rescue of a six-year-old boy from the local canal. The policeman who brought the boy to the bank collapsed from exhaustion and cold, and Mr. Bennett, assisted by a passer-by, began artificial respiration. When the policeman recovered he joined the other two in working hard to bring the boy round, but with little hope, as he had been submerged for a long time and was apparently lifeless. But by the time the ambulance arrived their efforts began to show signs of success, and we are pleased to be able to report that the lad is now perfectly well.

Mr. Bennett receives his certificate from Colonel W. J. Beddows

This incident had its sequel when Mr. Bennett, together with the policeman and the third man, was presented with the Royal Humane Society Resuscitation Certificate by Colonel Beddows, chairman of the Tettenhall magistrates.

NOBEL DIVISION

Mr. J. E. Lambert Retires

Nearly 43 years' service with Nobel Division ended with the retirement on 31st March of the joint managing director, Mr. J. E. Lambert.

Mr. J. E. Lambert

Mr. Lambert first joined the Company in 1911 as a laboratory assistant, but three years later found him a private in the R.S.F. serving in France. He also served in Russia, and when he was demobilised he had the distinction of a mention in despatches, the Belgian Croix de Guerre and the Order of Leopold. On return to civilian life he went to Glasgow University, where he graduated in 1922 with a B.Sc. in mining engineering. Then he went to the coal mines and qualified as a certified mine manager.

He rejoined Nobel's in 1925, and after nine years as practically the founder member of Technical Service Section he transferred to the production side. In 1942 he was made works manager at Ardeer, a post he held for two years during the high peak of the factory's intense war effort until appointed Personnel Manager in 1944. This was followed twelve months later by his promotion to the Division board as Personnel Director.

He returned to the scientific fold in 1948, when he became Production and Technical Service Director. Under his guidance technical service advanced steadily. Described by a colleague as "a man with nitroglycerine in his blood," Mr. Lambert is estimated to have travelled no less than a million miles by land, sea and air during the course of his work with the Company.

SALT DIVISION

Old Salt

Of Mr. William Henry Barnes, who retired on 31st March, it might be aptly said that he was a saltman by succession. For the connection of his family with the Salt Division and its antecedents goes back through his father and grandfather well over a hundred years.

His father, the late John Henry Barnes, who retired from the Salt Union through ill health in 1926, was the foreman at Cheshire Works, and his paternal grandfather the late William Barnes, who died in 1904, served Joseph Verdin & Sons and afterwards the Salt Union as manager of Newbridge Works. All three—Mr. Barnes, his father and grandfather—worked for the Salt Division or its predecessors throughout their working lives, and each during a large part of his service held a responsible position. Today the connection of the Barnes family with the Salt Division continues unbroken into the fourth generation through Mr. Barnes' son, Jack, who is a shift chargehand at West Area Vacuum Plant.

For 30 of his 47 years' service Mr. Barnes was a foreman at the open pan section. But during his career he had a number of other irons in the fire: he was fuel economy officer, leader of the works bomb disposal squad, chief of the works fire brigade, instructor of the Civil Defence unit, and first chairman of the Division foremen's association.

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BINDING OF 1956 MAGAZINES

The Kynoch Press have again agreed to bind *Magazines* and Divisional inserts for those readers who would like this done.

The cost will be 12s. 6d. for a volume of *Magazines* or a volume of inserts, and anyone who wants to take advantage of this offer should advise his *Magazine* correspondent now.

* * *

OUR NEXT ISSUE

1956 was a difficult year for I.C.I., as indeed for all industry. How did we come out of it? Has turnover increased? Has the increase (if any) been at the expense of profit margins? These and other questions will be answered when the Company's Annual Report is published, a digest of which will lead the June *Magazine*.

There are two other special features. One is an article on life with the Magadi Soda Company in Kenya written by W. H. Billington, who has spent 26 years there. This isolated group of people living at the bottom of the Rift Valley in Kenya, 4000 ft. below the hills and plateaux on either side, has to make its own community life, and the author looks back on the changes that he has seen in his time.

Lastly, a good piece by Denise Shortall, a 20-year-old laboratory assistant in Pharmaceuticals Division, who describes an assault without guides on the famed Matterhorn. The story of this adventure and the training and preparation behind it are vividly told.

SWEDEN

By Alan Allsop

Photograph by K. W. Gullers

"Of course, I should really like a Jag," remarked the workman, ruminatively supping his coffee out of his saucer, "but with taxation what it is I suppose I shall have to put up with the old Rover."

Having delivered himself solemnly of this patent testimony to the prosperity of what is perhaps the richest country in the world, he raised his cumbersome frame slowly from his table, paid 3s. 6d. for a breakfast which had included porridge, eggs, ham, sardines, tomatoes, cheese, and unlimited supplies of milk, bread, butter and buns, and resumed digging his hole in the road.

It is one of the beauties of industrial Sweden that the signs of the workaday world are soon left behind, the small towns of the south being virtually lakeside clearings in vast, endless forests of pine and silver birch. There is a mysterious, romantic quality about the dark lakes and sombre forests of the Swedish countryside. It is a beauty that impresses one despite, or perhaps even because of, its monotony. It is a dark sorcerer's land of fairy-myth and legend, a land which, until fifty years ago, was one of poor woodmen and struggling smallholders living in their wooden cottages much as their ancestors before them.

Country Swedes are hospitable and gentle, and some of the kindest folk in all the world. Far from being proud and "stuck up" as they are reputed to be, they take a tremendous interest in the foreigner—provided, of course, that he himself is not too stuck up to learn a little of their softly musical language, which is perhaps one of the easiest for an Englishman to acquire. The so-called Swedish pride is akin to an exaggerated sense of independence.

It is perhaps this old country virtue as much as any other which has made for Sweden's present prosperity, although, as malicious tongues elsewhere are always ready to observe, her non-participation in two world wars and her considerable mineral and timber wealth are by no means negligible factors. Though nominally democratic, Sweden is in fact ruled by an intellectual élite. No man may wield power of any kind unless he has the proven brains and ability to do so competently. There is no doubt that this autocratic policy "brings home the bacon."

This is borne out by a brief examination of conditions in the capital. The continuous influx of country folk seeking city jobs has swollen the town to such an extent as to create a serious traffic problem. The trouble is not allowed merely to solve itself but is tackled with a prompt and ruthless vigour. Blocks of (by non-Swedish standards) perfectly good shops and offices are pulled down to make broader thoroughfares and to allow the construction of clover-leaf crossings. Traffic is therefore continually on the move, if rather ruthless for the pedestrian.

Factories, run on electric power and therefore smokeless, are conceived of as things of beauty, and owners will compete with one another for the services of an outstanding architect. Set in ornamental gardens and of ultra-modern design, the factories inside are the last word in comfort and efficiency. It is the rule rather than the exception to see bowls of exotic plants along the window-sills of the well-lit, well-ventilated, draughtproof offices. One feels that they are almost *too* nice, as if the amenities of a beautiful home have become adulterated by workaday life.

Certainly there seems insufficient contrast between the factories and the modern blocks of flats that are everywhere springing up. They are too technically perfect, too much the product of intellect and not of a soul. One feels that the individual flat, the individual home, loses its identity in a structure that is merely set out to look imposing as an architectural whole. Ten- and twelve-storey flats, like castles of old, are perched imperiously among the pines on the many rocky eminences that rise from the flatness of the city proper, while in the base of the rock itself "car parks" have been hollowed out. One writes "car parks" because it is an open secret that in the event of war they would be used as nuclear-proof shelters.

What shall one say of Stockholm? Only that it is a lovely city, perhaps the finest in Europe north of the Alps. Little of the old town remains except that which is supremely beautiful; there are no slums. The madly whirling traffic is confined to the main circuits, so that even at rush hour one may wander at will.

The loveliest element of Stockholm is the water. The city is in fact built on a mass of little islands and peninsulas; it has been called the Venice of the North—erroneously, for Stockholm is modern and does not smell except of the delicious tang of the Baltic Sea.

There are many fine trips that may be made by water. It is the best way to see the town. And how lovely are the wooded banks and the thousand tiny islands that mark the pleasure-cruiser's course! Many families rent an island for their holidays and laze in the warm, delicious sun of the Swedish summer or, bronzed and naked, swim languidly in the warm, inviting waters.

Dawn breaks *over Stockholm, capital city of 7½ million inhabitants*

In the big cities a tip worth remembering is to use either the local *Konsum* restaurant (where a dinner and dessert may be had for 4s. 6d. to 5s. 6d.) or the *Hushaalskolan*. The fixed charge for entry to one of the latter in Stockholm is 5s., and then you are free to eat just as much as you like, except for the hot meat or fish dish.

There are a number of small tables around the perimeter of the room at which the customers eat. In the middle of the room is one large central table (*smörgaasbord*) from which you may help yourself to a variety of different foods, for example porridge, stewed fruit, three or four types of bread (including one mixed with black treacle), biscuits, butter, milk, herrings, white fish and fried potatoes, sardines, ham, brawn, Russian salad, cheese and jam. If your digestive system is good enough you can eat enough at one sitting to last you the whole day. On a separate, smaller table coffee, sugar and cream are provided. No self-respecting Swede, incidentally, would dream of offering you anything but cream with your coffee.

It must not be imagined from this that the *Hushaalskolan* is just a cheap sort of eating house. Everything is dazzlingly clean and the food is artistically presented. It is first and foremost the place where the average Swede eats, and you can find there an interesting cross-section of Swedish life; studious lawyers, smart city girls, and office and factory workers are all mixed together. There is no class distinction in Sweden, and a duke may mix with a dustman without any loss of social prestige to the latter.

Much is said and written of immorality in Sweden, although to a casual holiday visitor signs of this are not always apparent. Foreigners resident in Sweden, however, confirm that it is only too true: immorality *is* widespread in Sweden. Before readers rush to ring their travel agents, however, it should be pointed out that there is a very different aspect of Swedish life, and one that has failed to interest the more popular of our Sunday newspapers. There is a hard core of the Swedish public whose lives are wholly governed by the discipline of religion.

No holiday in Sweden is complete without visiting one of the many beautiful churches and watching the extreme reverence with which things spiritual are treated. I once attended an organ recital in one of Stockholm's finest churches and was taken aback when, at the end and with the rest of the audience, I was expected to join in the singing of a psalm. The house of God is too much respected in Sweden to be treated as a concert hall.

Breton Lacemaker

Photo by P. R. Henderson (Wilton Works)